US006375116B1

(12) **United States Patent**
Askins et al.

(10) **Patent No.: US 6,375,116 B1**
(45) **Date of Patent: Apr. 23, 2002**

(54) **CORE END PLUG FOR SHEET ROLL MATERIAL**

(75) Inventors: **Paul Askins**; **Vincent Dethier**; **Jeffrey Mock**, all of Rochester, NY (US)

(73) Assignee: **A.B. Dick Company**, Niles, IL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 7 days.

(21) Appl. No.: **09/669,820**

(22) Filed: **Sep. 26, 2000**

(51) **Int. Cl.**[7] **B65H 75/14**
(52) **U.S. Cl.** **242/609**; 242/609.4; 242/612; 242/599.2; 242/599.4
(58) **Field of Search** 242/609, 609.4, 242/612, 599.2, 599.4

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,320,068 A * 5/1943 Crebbs 242/599.4

* cited by examiner

Primary Examiner—John Q. Nguyen
(74) *Attorney, Agent, or Firm*—Pearne & Gordon LLP

(57) **ABSTRACT**

A core end plug for mounting a roll of sheet material on a shaft. The plug comprises a cylindrical band of stiffly flexible plastic material having ends defining a longitudinal gap therein. A plurality of radial webs extend inwardly from the band. A pair of the webs are opposite each other and are provided with first and second elongated apertures which define identical acute angles to the diameter of the band. A third web defines third and fourth elongated apertures along a common major axis perpendicular to the diameter. A band is fitted into each end of a roll core and a mounting plate is inserted into each core end plug. A mounting shaft extends through central apertures in the mounting plates and through the fourth aperture in the third web. Pins in the mounting plate are received in the first and second elongated apertures.

15 Claims, 4 Drawing Sheets

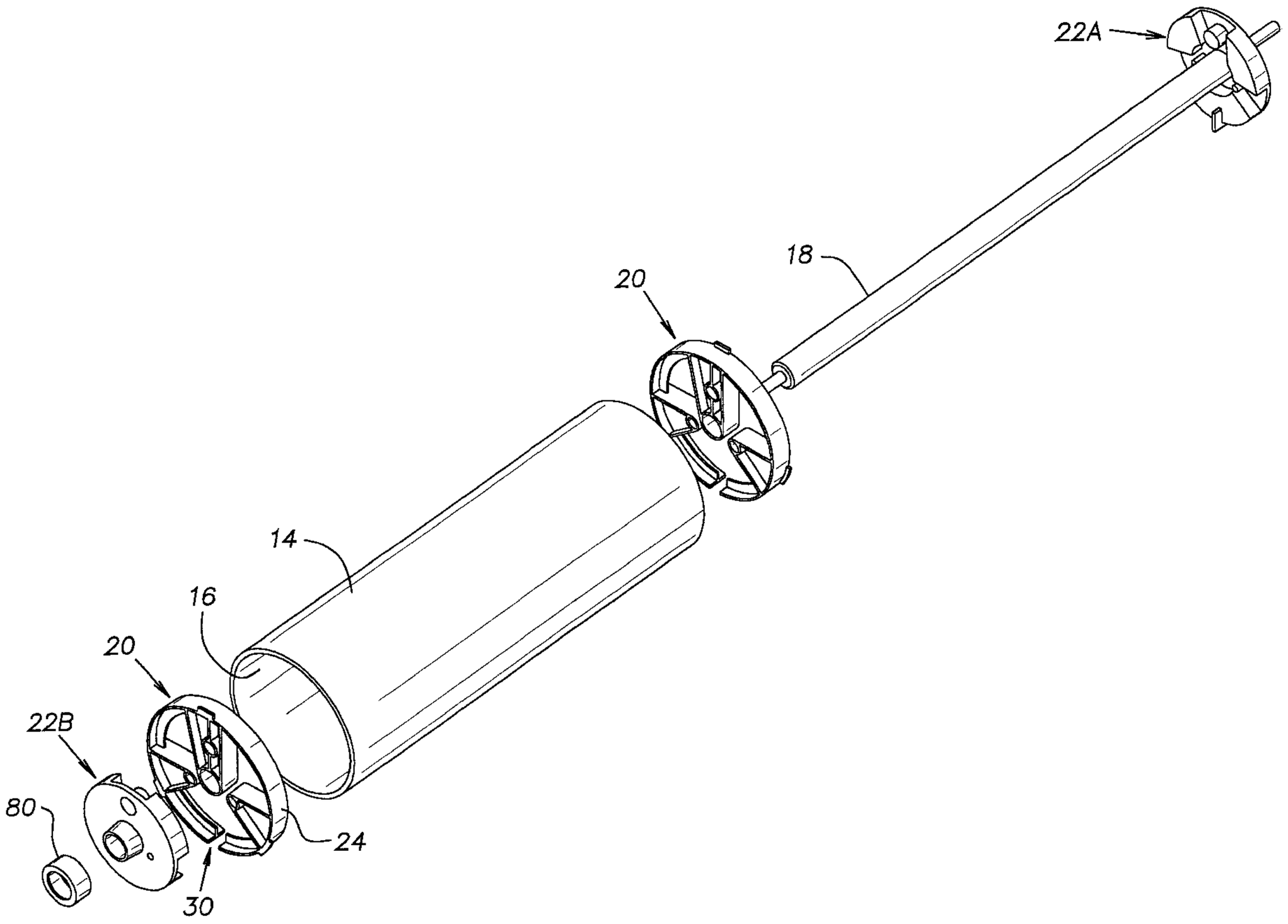
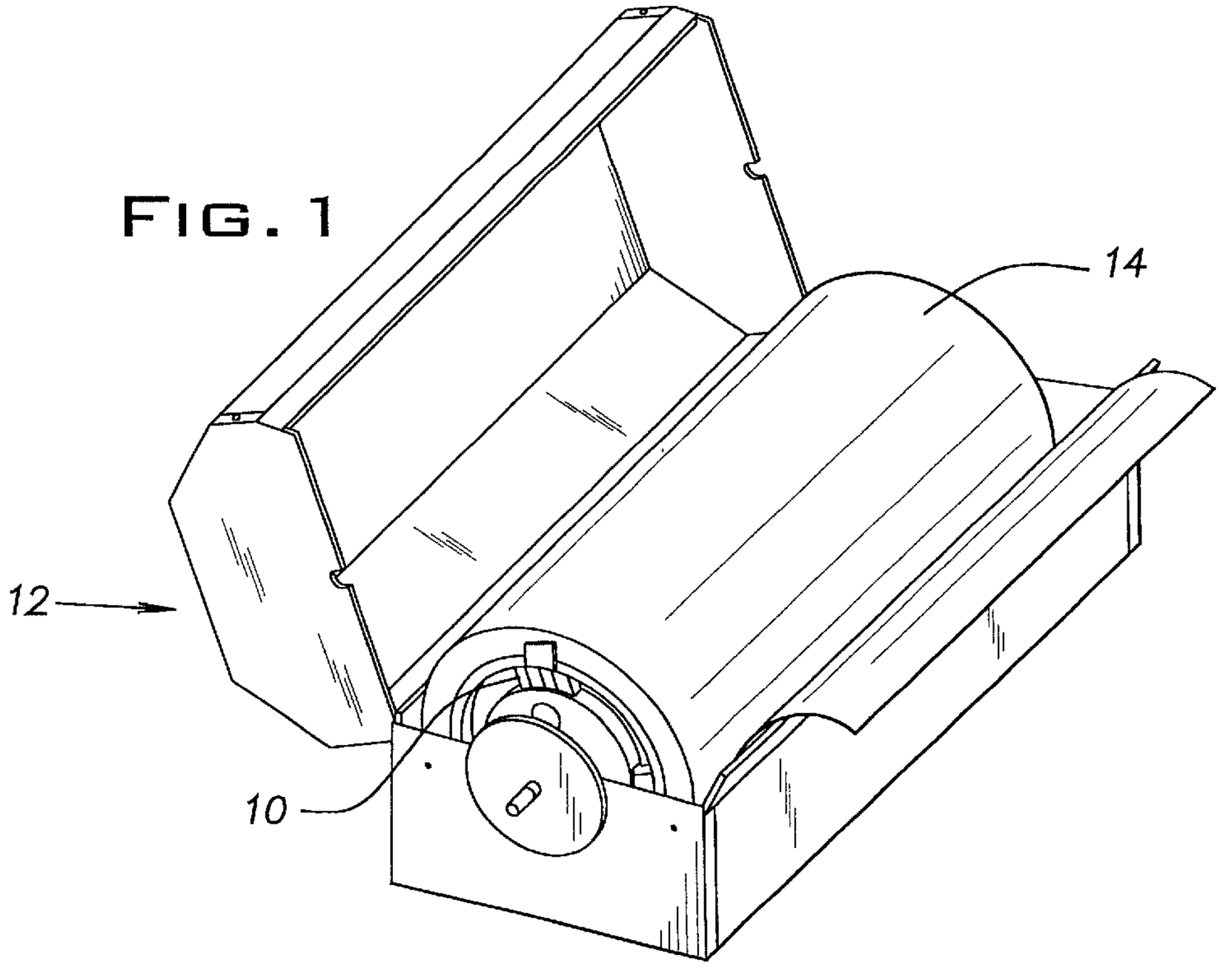


FIG. 1


14
12
10

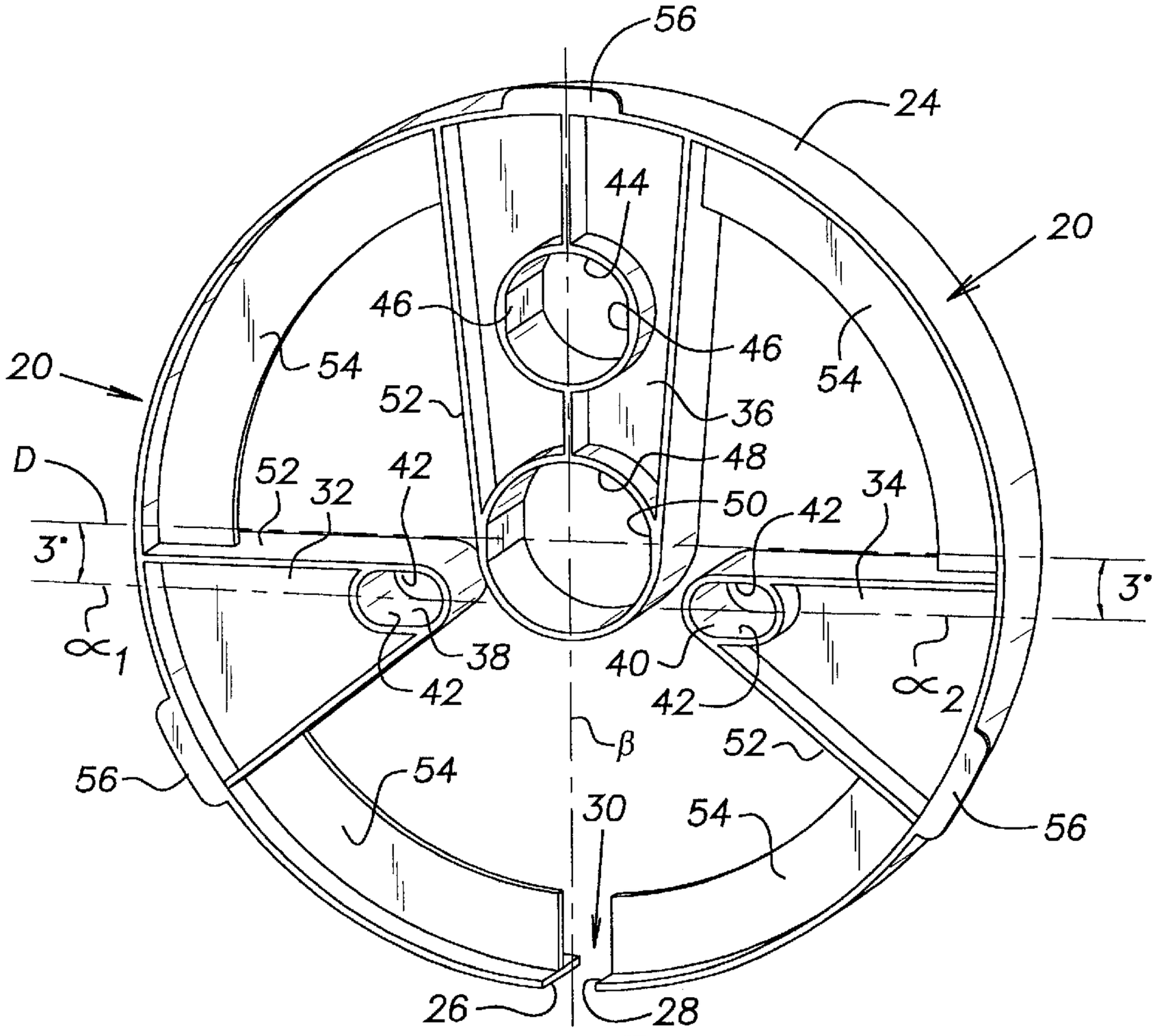

56
24
44
20
46
46
54
54
20
52
36
D
52
32
42
48
50
42
34
3°
3°
α_1
α_2
38
42
40
42
β
52
54
54
56
56
30
26
28

FIG. 3

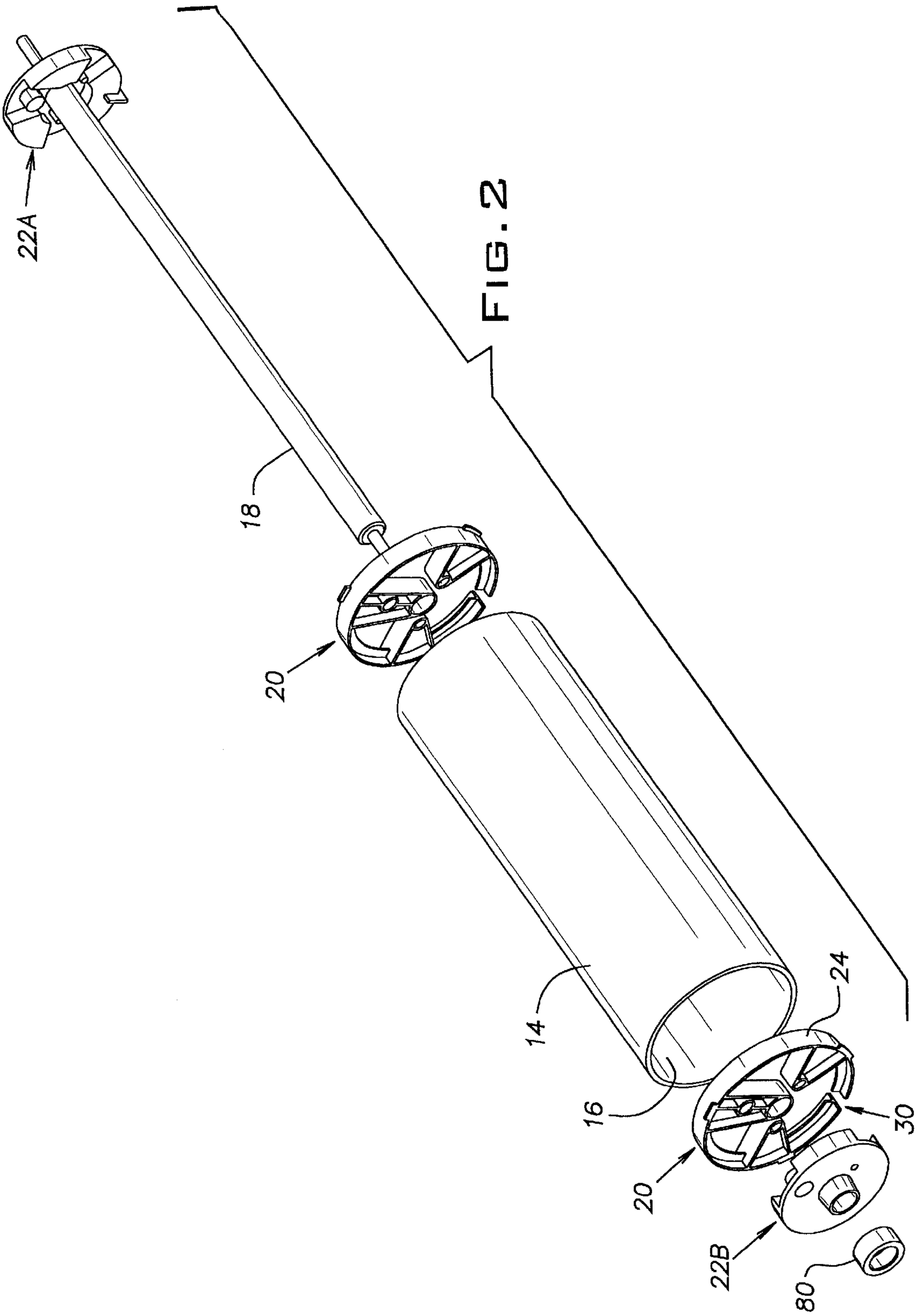


FIG. 2

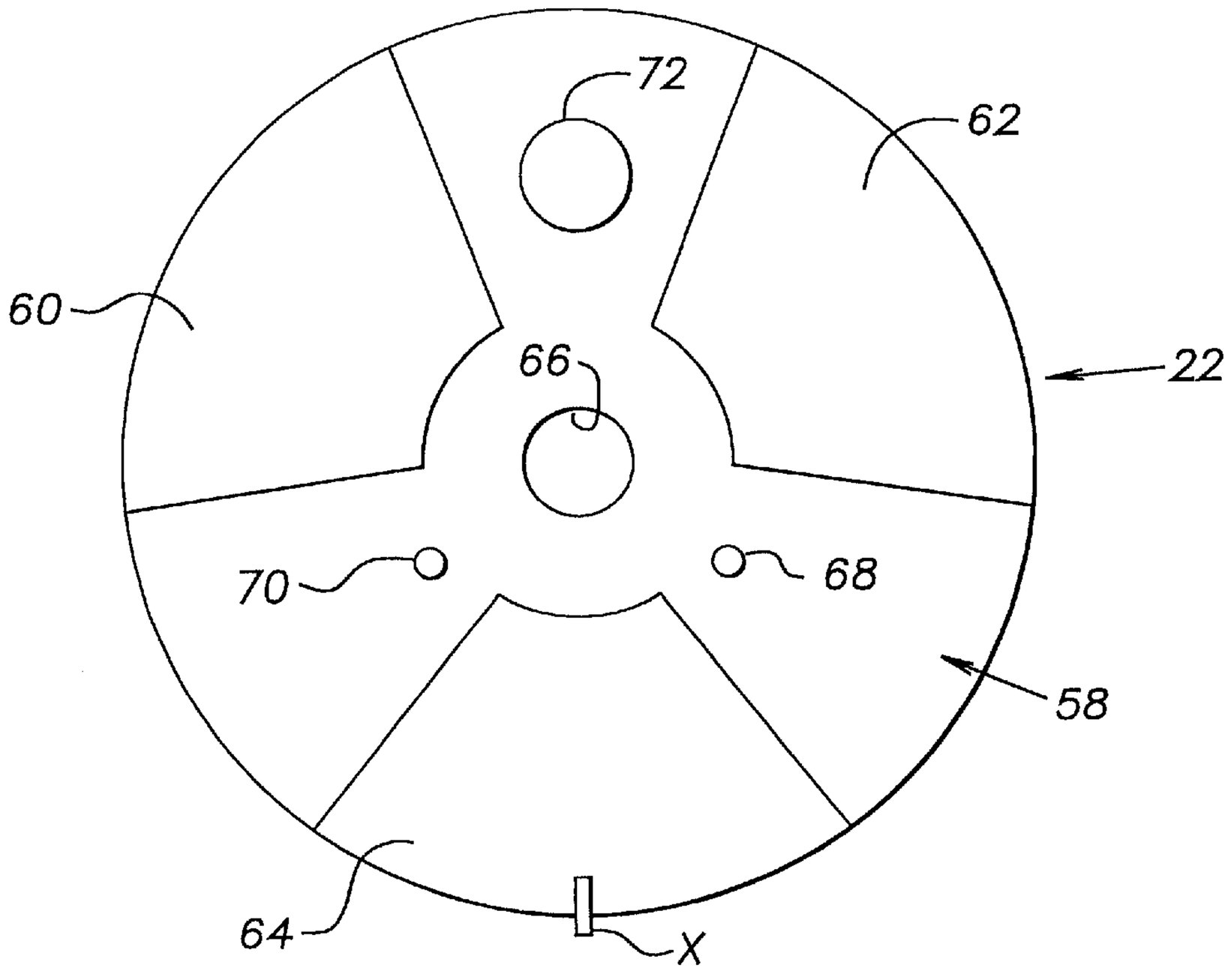

72
62
60
66
22
70
68
58
64
X

FIG. 4

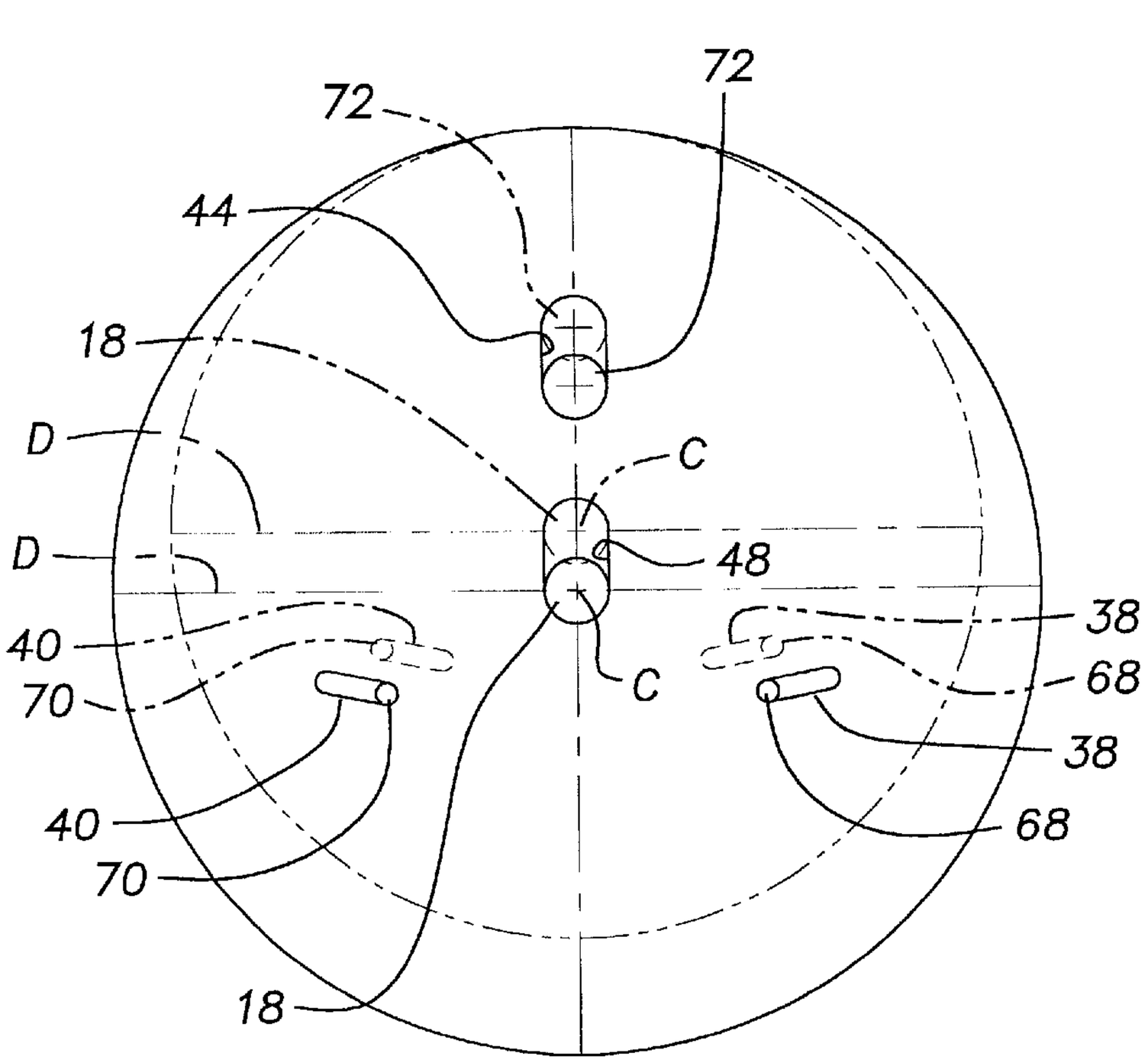

72
72
44
18
D
D
C
48
40
70
C
38
68
38
40
68
70
18

FIG. 5

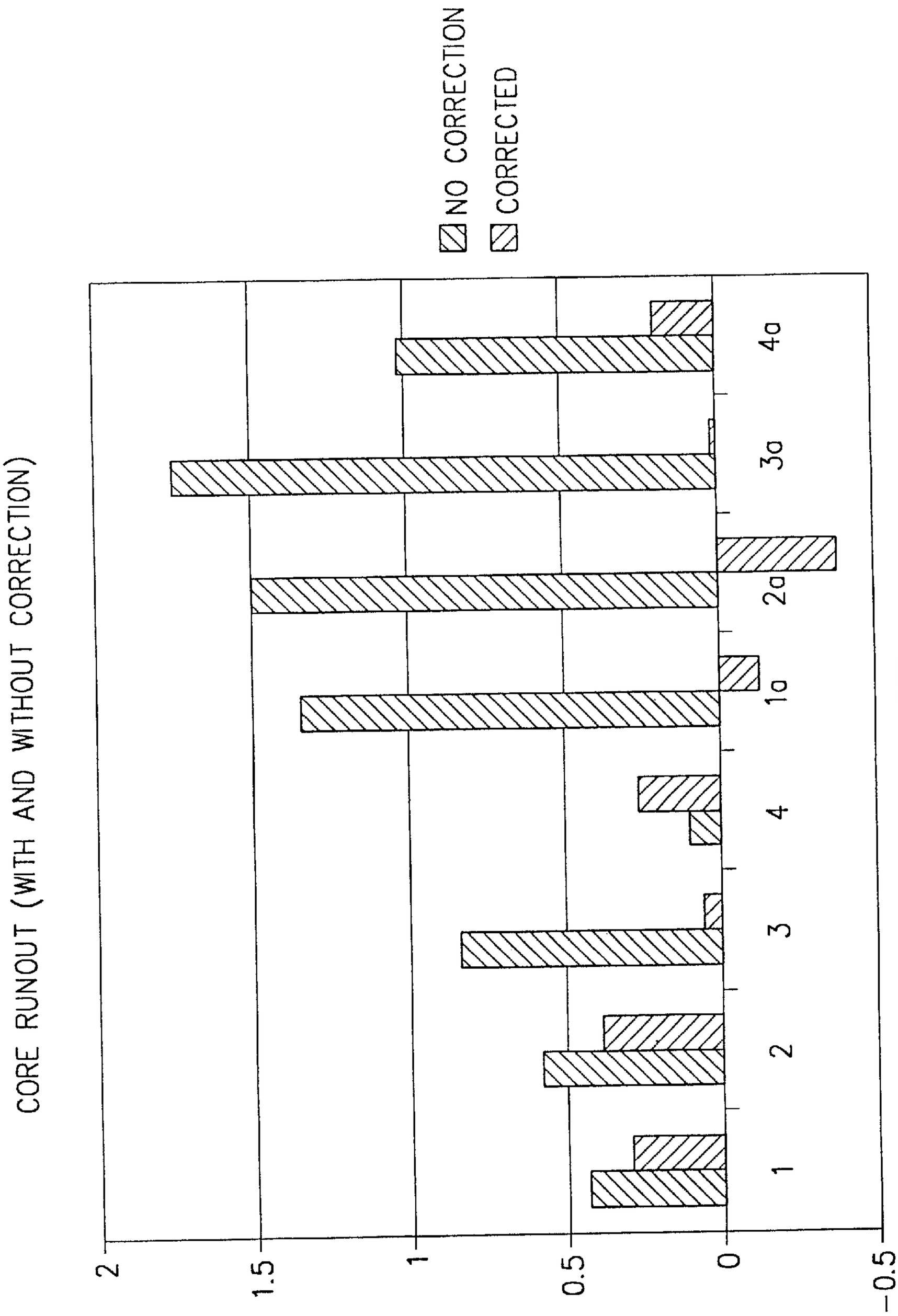

NO CORRECTION
CORRECTED
CORE RUNOUT (WITH AND WITHOUT CORRECTION)
TOTAL RUNOUT, mm
2
1.5
1
0.5
0
−0.5
1
2
3
4
5
6
7
8
9
10
CORE NUMBER

FIG. 6

CORE END PLUG FOR SHEET ROLL MATERIAL

This invention relates to core end plugs and, more particularly, end plugs for mounting rolls of photosensitive material in graphic art devices such as platemakers.

BACKGROUND OF THE INVENTION

Photosensitive materials are typically supplied in roll form by winding the photosensitive material onto a core. The core is disposed of once all the photosensitive material has been used. Paperboard is the most common material for the core because of its low cost. The interface between the roll of photosensitive material and most devices, which expose the photosensitive material, is the inside diameter of the paperboard core. On many devices that expose photosensitive material, such as platemakers, the position of the photosensitive material must be accurately controlled to allow the image to be accurately placed on the material. This requires a tight connection between the paperboard core and its mounting within the device. A loose connection would allow movement between the core and its mounting and therefore, poor registration between the image and the material. A tight connection becomes difficult because of manufacturing variations in the paperboard core. The inside diameter of the core can vary by as much as 1.2 mm. To accommodate this variation, the mounting in the device must either be oversized, adjustable in size, or tapered in size. These options present difficulties. An oversized mounting makes it difficult to install and remove because of the force required to press the mounting into the core. An adjustable mounting adds complexity and cost to the device and is prone to user error. A tapered fit changes the axial position of the roll.

SUMMARY OF THE INVENTION

This invention provides an interface between a photosensitive material cassette and the paperboard core of the roll mounted therein. According to this invention, a core end plug comprises a cylindrical band of stiffly flexible plastic material having ends defining a longitudinal gap therein. A plurality of radial webs extend inwardly from the band. A pair of the webs are opposite each other and are provided with first and second elongated apertures having parallel longitudinal sides defining identical acute angles of about 3° to a first diameter of the band. A third web defines third and fourth elongated apertures having parallel longitudinal sides and having a common major axis aligned with a second diameter of the band which is perpendicular to the first diameter.

A core end plug is easily fitted into each end of a roll core and may be cemented therein to be disposed with the core. Radially extending tabs are provided on the outer edges of each band to butt against the ends of the roll of material.

A mounting plate is inserted into to each core end plug. Each mounting plate has first and second pins equidistantly spaced from a central axis of the plate and are respectively received in the first and second apertures of the opposite pair of webs. A third pin on the mounting plate is received in the third aperture in the third web.

A mounting shaft extends through a central aperture in each mounting plate and through the fourth aperture in the third web. The axis of the shaft remains colinear with the axis of the core for all degrees of flexure of the band to fit into the core. The angled slots or apertures in the first and second webs shift the position of the first and second pins of the mounting plate relative to its end plug as the diameter of the band is varied by flexure so that the axis of the mounting shaft is always coaxial with the axis of the core. This prevents wobble of the roll while the sheet material is being pulled from the roll.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a mounting assembly positioned in a cassette;

FIG. **2** is an exploded, perspective view of a mounting assembly according to the invention;

FIG. **3** is a perspective view of an end plug according to the invention;

FIG. **4** is an elevational view of a mounting plate according to the invention;

FIG. **5** is a schematic representation of the roll-centering feature of the invention; and

FIG. **6** is a chart showing corrected and uncorrected runout of various cores.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, there is illustrated a mounting assembly **10** arranged in a roll cassette **12** which is used to feed photosensitive sheet material to a platemaker.

The mounting assembly **10** supports a roll of photosensitive sheet material **14** wrapped on a paperboard core **16**. A mounting shaft **18** extends axially through the core **16**. An end plug **20** and a mounting plate **22** are provided at each end of the shaft **18**.

Each end plug **20** comprises a cylindrical band **24** of stiffly flexible plastic material having ends **26** and **28** which define a longitudinal gap **30** therein. A plurality of radial webs **32, 34,** and **36** extend inwardly from the band **24,** and the webs **32** and **34** are provided with elongated apertures **38** and **40** having parallel longitudinal sides **42** and major axes α_1 and α_2 which define acute angles of about 3° with a first diameter D of the end plug **20**. The web **36** is provided with a third elongated aperture **44** having parallel elongated sides **46** and a major axis β which is perpendicular to the diameter D and which is colinear with another diameter of the plug **20**. The web **36** is further provided with a fourth elongated aperture **48** having parallel elongated sides **50** and a major axis which is colinear with the major axis β and, therefore, the other diameter of the plug **20**.

Each web **32, 34** and **36** is defined by stiffening sides **52** having an axial extent corresponding to the axial extent of the band **24**. A stiffing rib **54** extends radially inwardly from the band **24** between the webs **32, 34** and **36** and coplanar thereto.

The plug **20** is preferably injection molded from a suitable thermoplastic, and since it is a low cost item, it may be bonded to the paperboard core to be disposed therewith. The end plugs **20** are constructed so that they have an initial outside band diameter which is slightly larger than the maximum inside diameter of a core **16** so that the gap **30** is narrowed and the band **24** assumes a smaller diameter when the plugs **20** are inserted and cemented within the open ends of the core **16**. A plurality of tabs **56** extend radially outwardly from the band **24** and engage the ends of the core **16** to ensure that the plugs **20** are properly seated in the core **16**.

The shaft **18** is mounted through the aperture **48** in each plug **20** and a mounting plate **22** is mounted on each

protruding end of the shaft **18**. Each mounting plate **22** may be metal or plastic and comprises a base **58** having a plurality of raised sectors **60**, **62**, and **64**. Each mounting plate **22** has a central cylindrical opening **66** which receives the end of the shaft **18** with a close fit. The mounting plate **22**A is permanently fixed to the shaft **18**, and the mounting plate **22**B is axially advanced on the shaft **18** until the base **58** engages the stiffening sides **52** of the plug **20**. The sectors **60**, **62** and **64** and the tab X aid in aligning the pins **68**, **70** and **72** of the mounting plate **22** to the apertures **38**, **40** and **44** of the plug **20**. A plurality of cylindrical pins **68**, **70**, and **72** are respectively received in the apertures **38**, **40**, and **44**. The diameters of the pins **68** and **70** correspond to the distance between the parallel sides **42** of the apertures **38** and **40** and the diameter of the pin **72** corresponds to the distance between the sides **46** of the aperture **44**. The shaft **18** extends through the aperture **48** and has a diameter corresponding to the distance between the parallel elongated sides **50**.

Flexure of the band **24** to accommodate the inside diameter of the core reduces the diameter of the band **24** but the apertures **38** and **40** ensure that the center of the roll remains at the center of the band during flexure. This may be more readily apparent from FIG. **5**. Actual flexure of the band **24** is usually no more than several millimeters. The flexure illustrated in FIG. **5** is, therefore, greatly exaggerated to demonstrate this feature of the invention.

In FIG. **5**, it is assumed that the diameter of the band **24** is reduced from its solid outline position to its phantom outline position to insert the plug **20** into the core **16**. This flexure moves the apertures **38** and **40** from their solid outline position to their phantom outline position to reposition the pins **68**, **70** and **72** as shown. Repositioning the pins **68**, **70** and **72** also repositions the center C of the shaft **18** to position the shaft **18** at the center of the reduced diameter band **24** and therefore, at the center of the core **16**.

After the core is positioned on the mounting assembly, the mounting plate **22**B is pushed toward the mounting plate **22**A to remove any clearance. Then a locking nut **80**, which was previously loosely placed on the end portion of the mounting plate **22**B, is tightened. The assembly is placed in the cassette **12** as is shown in FIG. **1**.

FIG. **6** compares roll center eccentricity or runout of a roll according to this invention with a prior art loose fit mounting arrangement (no correction). By minimizing runout, the position of the photosensitive material is accurately controlled to allow the image to be accurately placed on the material.

While the invention has been shown and described with respect to particular embodiments thereof, those embodiments are for the purpose of illustration rather than limitation, and other variations and modifications of the specific embodiments herein described will be apparent to those skilled in the art, all within the intended spirit and scope of the invention. Accordingly, the invention is not to be limited in scope and effect to the specific embodiments herein described, nor in any other way that is inconsistent with the extent to which the progress in the art has been advanced by the invention.

What is claimed is:

1. A core end plug for mounting a roll of sheet material on a shaft comprising a cylindrical band of stiffly flexible material having ends defining a longitudinal gap therein, a plurality of radial webs extending inwardly from said band, a substantially opposite pair of said webs each defining an elongated aperture having parallel longitudinal sides defining an acute angle to a first diameter of said band, and another of said webs defining a first elongated aperture having parallel longitudinal sides and having a major axis aligned with a second diameter of said band.

2. A core end plug according to claim **1** wherein said first diameter and said second diameter are perpendicular to each other.

3. A core end plug according to claim **2** wherein said second diameter bisects said gap.

4. A core end plug according to claim **1** wherein said another of said webs defines a second elongated aperture having a major axis aligned with said second diameter.

5. A core end plug according to claim **1** wherein said acute angle is about 3°.

6. A core end plug according to claim **1** including radial tabs extending outwardly from an edge of said band.

7. A core end plug according to claim **1** including a reinforcing rib extending inwardly from said band.

8. A mounting assembly for a roll of sheet material wound on a cylindrical core having an inside diameter and a longitudinal axis, said mounting assembly comprising a mounting shaft adapted to extend axially through said core and having a longitudinal axis, an end plug and a mounting plate at each end of said shaft, with one or both of the mounting plates being removably fixed to said shaft at a central axis of said plate so that the axis of said shaft and said central axis are colinear, each end plug comprising a cylindrical band of stiffly flexible material having ends defining a longitudinal gap therein, a plurality of radial webs extending inwardly from said band, a substantially opposite pair of said webs each respectively defining first and second elongated apertures having parallel longitudinal sides defining an acute angle to a first diameter of said band, and another of said webs defining a third elongated aperture having parallel longitudinal sides and having a major axis aligned with a second diameter of said band, said mounting plate having first and second pins equidistantly spaced from said central axis and being respectively received in said first and second apertures, said mounting plate having a third pin extending into said third aperture, each band being received in an open end of said core, and having an initial outside diameter reduced to correspond to the inside diameter of said core by flexure of said band and reduction of the longitudinal gap therein and reduction of an outside diameter thereof, said axis of said shaft, said central axis of said plate and said longitudinal axis of said core being colinear for all reductions of said outside diameter.

9. A mounting assembly according to claim **8** wherein said first diameter and second diameter are perpendicular to each other.

10. A mounting assembly according to claim **8** wherein said second diameter bisects said gap.

11. A mounting assembly according to claim **8** wherein said another of said webs defines a second elongated aperture having a major axis aligned with said second diameter.

12. A mounting assembly according to claim **8** wherein said acute angle is about 3°.

13. A mounting assembly according to claim **8** including radial tabs extending outwardly from an edge of each said band and engaging each said open end of said core or roll of material.

14. A mounting assembly according to claim **13** wherein each band is adhesively secured within each said open end of said core.

15. A mounting assembly according to claim **8** wherein said acute angle is at any angle which maintains colinear axes of mounting plate and end plug for all reductions of outside diameter of end plug.

* * * * *